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## Technical Note

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**Date:** December 17, 1998

**Re:** Compressing images using MrSid, Image Alchemy, and ARC/INFO

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### INTRODUCTION

MrSid, the Image Alchemy JPEG option, and the ARC/INFO TIFF compression option were compared by compressing TIFF images of a 24-bit scanned aerial photograph and a Digital Raster Graphic (DRG) 7.5' USGS quad. These image compression options were selected because they all can be displayed in ArcView. MrSid and the Image Alchemy JPEG option are both lossy compression algorithms. Images compressed with a lossy algorithm are not identical to the original. The ARC/INFO TIFF option uses PackBits to compress the image and is a lossless algorithm.

MrSid is image compression software developed by LizardTech, Inc. ([www.lizardtech.com](http://www.lizardtech.com)). The MrSid file format is proprietary. ArcView 3.0a displayed the images discussed in this technical note using the new extension for displaying MrSid images in ArcView 3.1. The new extension was supplied by Lizardtech, Inc. ArcView 3.1 will directly support the display of MrSid images. Image Alchemy is image manipulation software developed by Handmade Software ([www.handmadesw.com](http://www.handmadesw.com)). We compressed images using ARC/INFO and Image Alchemy in-house. We sent Lizardtech, Inc. the scanned aerial photograph and DRG and they returned the MrSid compressed images.

### SCANNED AERIAL PHOTOGRAPH

The original TIFF image is a mosaic of scanned NAPP photos (27.5 Mbytes). The photos were scanned at 300 dpi and the pixel size is 3.4 meters. All the following comparisons of image quality were done by zooming in on small areas less than one square mile in size. When viewing a complete township of scanned photos on the monitor all the images look similar. The figures show an area approximately 500 by 500 meters (60 acres).

MrSid compressed the image at 23:1 and 50:1 resulting in images of 1.1 and 0.5 Mbytes, respectively. The image was also compressed using the Image Alchemy JPEG option. The JPEG option allows the user to input a number that relates to the quality of the output; a lower number results in lower quality and higher compression. Images were compressed using 50, 40, 30, 20, and 10, resulting in image sizes of 3.9, 3.4, 2.7, 2.0, and 1.2 Mbytes, respectively. The ARC/INFO TIFF compression option only compressed the image to 25.7 Mbytes; this only reduced the image size by 7% so it was not evaluated.

The 23:1 MrSid compressed image most closely matches the number 30 JPEG image in image quality. Close inspection reveals that the JPEG image compressed at 30 retains the original shape of some small features better than the MrSid image.

The 50:1 MrSid compressed image was of poor quality showing a very blurry effect throughout the entire image. JPEG images at 50, 40, and 30 were of good quality and were difficult to distinguish from the original. JPEG images at 20 and 10 were of poor quality, showing a blurring and blocky effect. The default JPEG compression is 32, which corresponds very closely to the minimum level for good quality. The default MrSid compression ratio is 20:1.

## USGS 7.5' DRG

The format for DRGs as delivered by the USGS is TIFF compressed using PackBits. IDWR is currently processing all the 7.5' DRGs of Idaho. The process includes clipping the collars, projecting the DRGs to the Idaho Transverse Mercator (IDTM) projection, and then recompressing the DRGs for archiving on CD. We evaluated the compression options before recompressing the DRGs for archiving. To evaluate the compression options the original DRG (5.5 Mbytes) was converted to a grid, clipped to the collar, projected to IDTM, and then converted to an uncompressed TIFF image. The resulting TIFF image was 23.3 Mbytes in size. The ARC/INFO TIFF compression option compressed the TIFF image to 4.9 Mbytes using PackBits. Image Alchemy can also compress TIFF images using PackBits. The MrSid target compression ratio was 25:1 but it output an image compressed at 11:1, resulting in an image size of 2.1Mbytes. Image Alchemy compressed the images with the JPEG option using 50, 30, and 10, resulting in images of 8.0, 6.0, and 3.1 Mbytes, respectively. The figures show an area approximately 600 by 600 meters (86 acres).

The ARC/INFO compressed TIFF image is identical to the original in quality and draw time. The MrSid image has a salt and pepper effect of light gray pixels throughout the entire DRG. A halo effect of light gray pixels appears around all features in the JPEG images. The effect is very noticeable because it occurs around features bordered by white areas.

## DRAW TIMES

Table 1 lists the draw times for the scanned photos and DRGs. These draw times are for displaying the entire image. Draw times for the MrSid images are significantly faster than with the JPEG images.

## SUMMARY

A good point of JPEG and TIFF images is that these file formats are open and can be used by a large variety of software. An advantage of MrSid images is the very fast draw times in comparison to JPEG images. The fast draw times may be necessary for applications requiring fast access to a large quantity of large images.

Considering the above observations we decided that the JPEG option in Image Alchemy meets our needs for compressing 24-bit images of scanned photos. The image quality of 30, very close to the default 32, gives the best trade-off between image quality and compression. But JPEG images are not a good solution for compressing DRG images—the resulting images are of poor quality. The ARC/INFO or Image Alchemy TIFF compression option using PackBits is a good solution for compressing DRGs at an almost 5:1 compression ratio without any loss in image quality. But the TIFF PackBits option does not compress scanned photo images enough to be useful for that purpose.

Table 1. Image size and draw times.

	Image Type	Image Size in Mbytes	Draw Time in Seconds
Scanned Photos	Original TIFF	27.5	2
	MrSid 50:1	0.5	1
	MrSid 23:1	1.1	1
	JPEG 50	3.9	14
	JPEG 40	3.4	13
	JPEG 30	2.7	13
	JPEG 20	2.0	12
	JPEG 10	1.2	10
DRG	Uncompressed TIFF	23.3	1
	ARC/INFO compressed TIFF	4.9	1
	MrSid 11:1	2.1	1
	JPEG 50	8.0	30
	JPEG 30	6.0	27
	JPEG 10	3.1	23

Figures 1 through 14 display all the images discussed in this technical note.

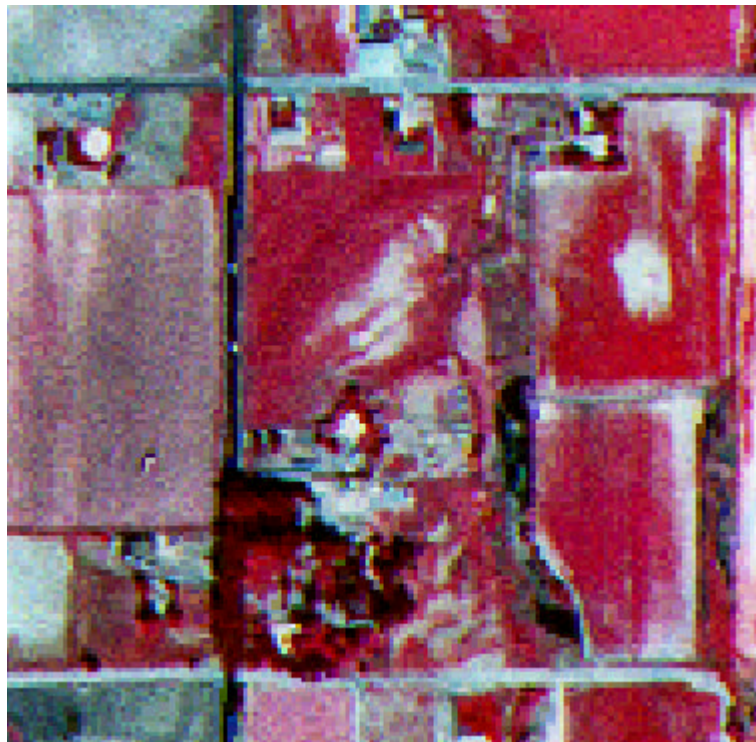


Figure 1. Original TIFF image of Scanned Aerial Photograph (27.5 Mbytes).

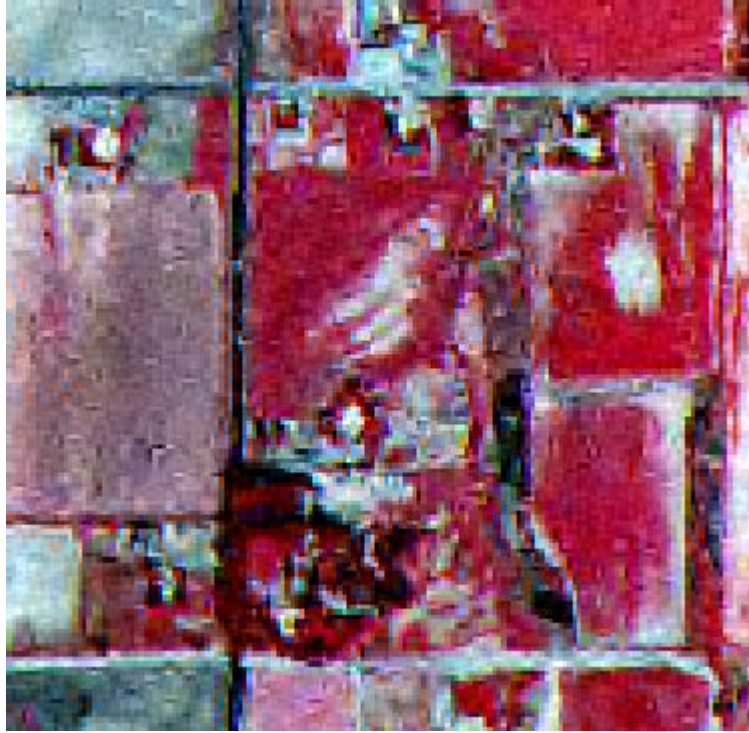


Figure 2. MrSid 23:1 compressed Scanned Aerial Photograph (1.1 Mbytes).



Figure 3. MrSid 50:1 compressed Scanned Aerial Photograph (0.5 Mbytes).

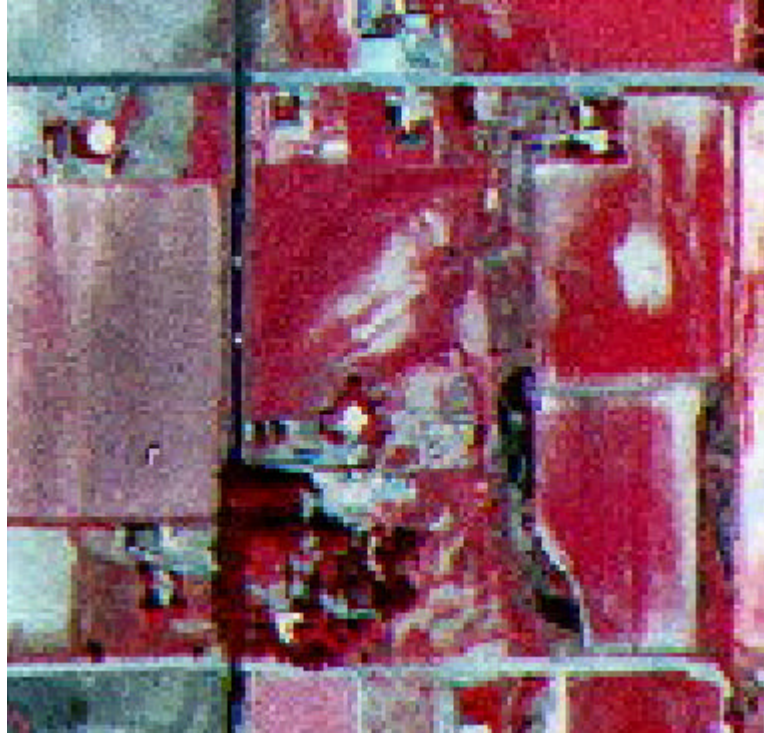


Figure 4. JPEG 50 compressed Scanned Aerial Photograph (3.9 Mbytes).

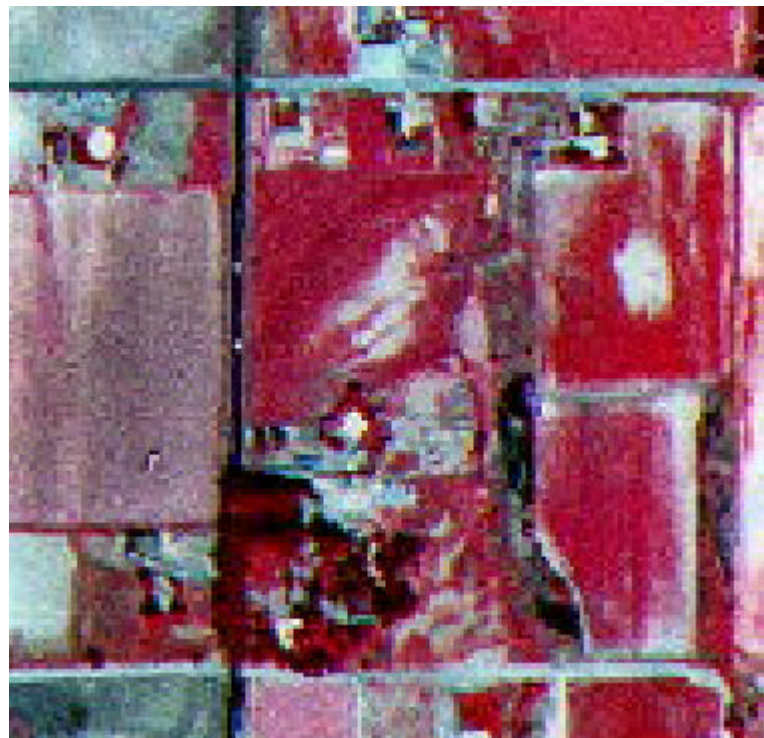


Figure 5. JPEG 40 compressed Scanned Aerial Photograph (3.4 Mbytes).

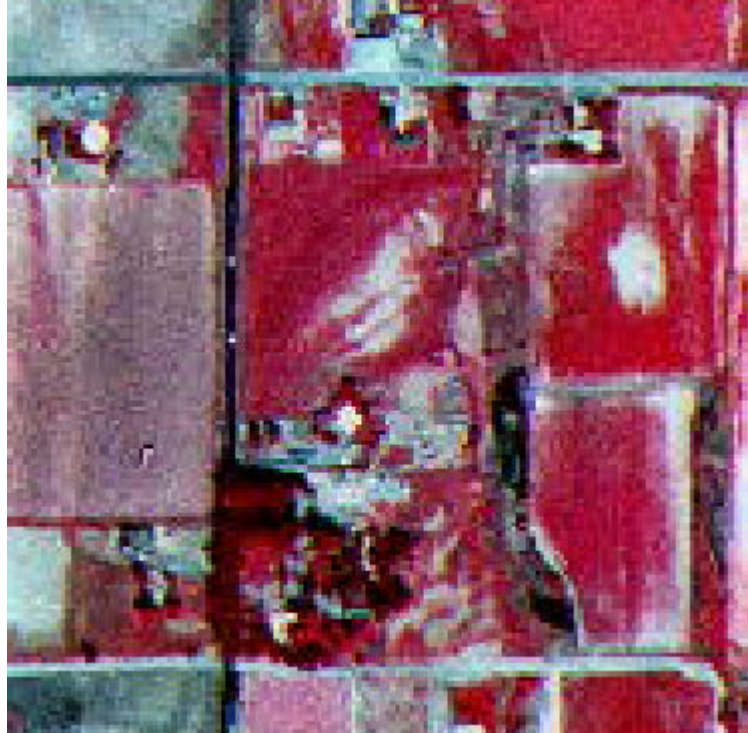


Figure 6. JPEG 30 compressed Scanned Aerial Photograph (2.7 Mbytes).

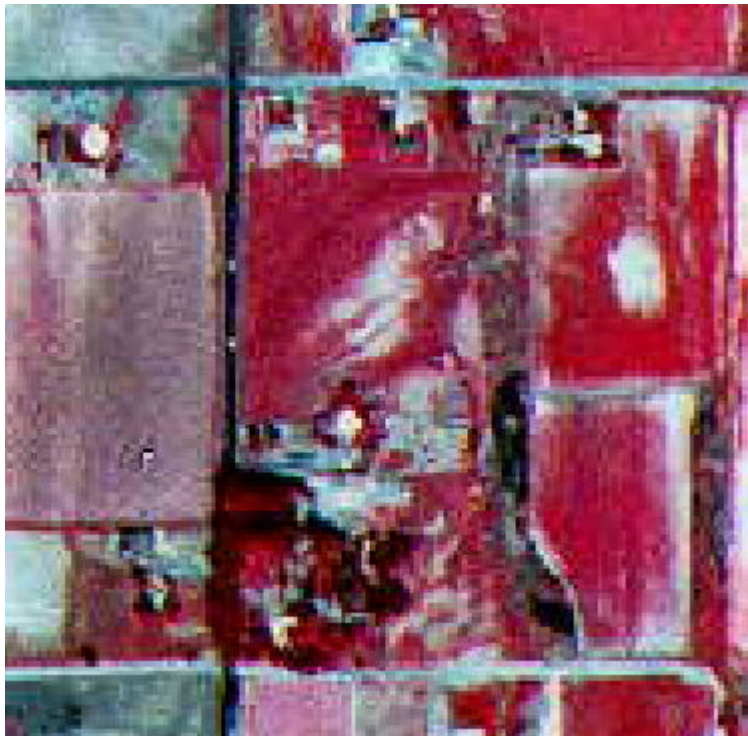


Figure 7. JPEG 20 compressed Scanned Aerial Photograph (2.0 Mbytes).



Figure 8. JPEG 10 compressed Scanned Aerial Photograph (1.2 Mbytes).

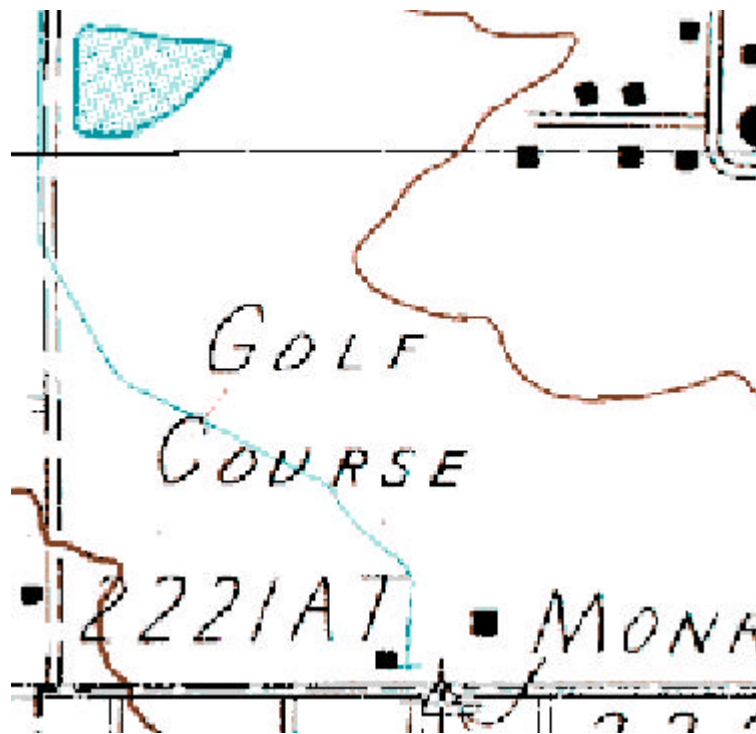


Figure 9. Original TIFF image of 7.5' USGS DRG (23.3 Mbytes).

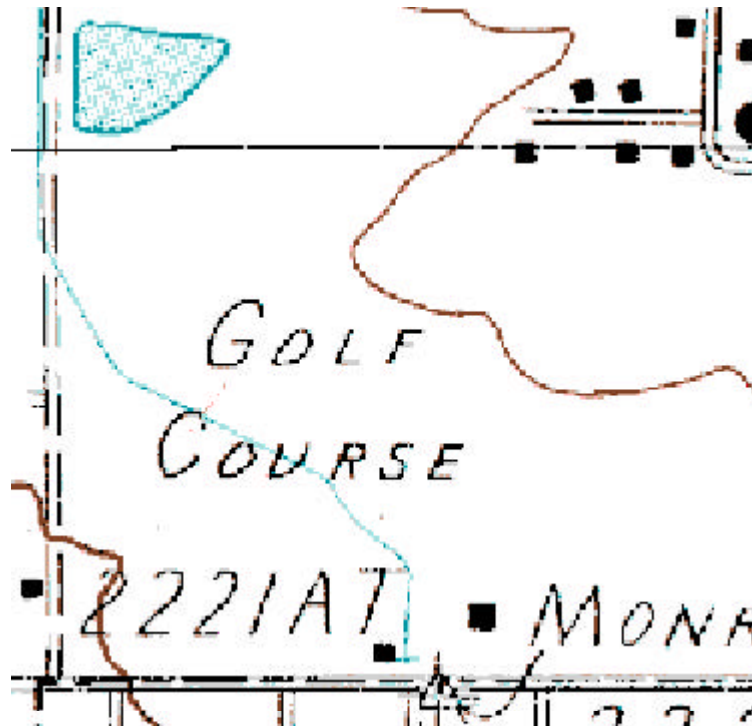


Figure 10. ARC/INFO compressed TIFF image of 7.5' USGS DRG (4.9 Mbytes).



Figure 11. MrSid 11:1 compressed 7.5' USGS DRG (2.1 Mbytes).



Figure 12. JPEG 50 compressed 7.5' USGS DRG (8.0 Mbytes).

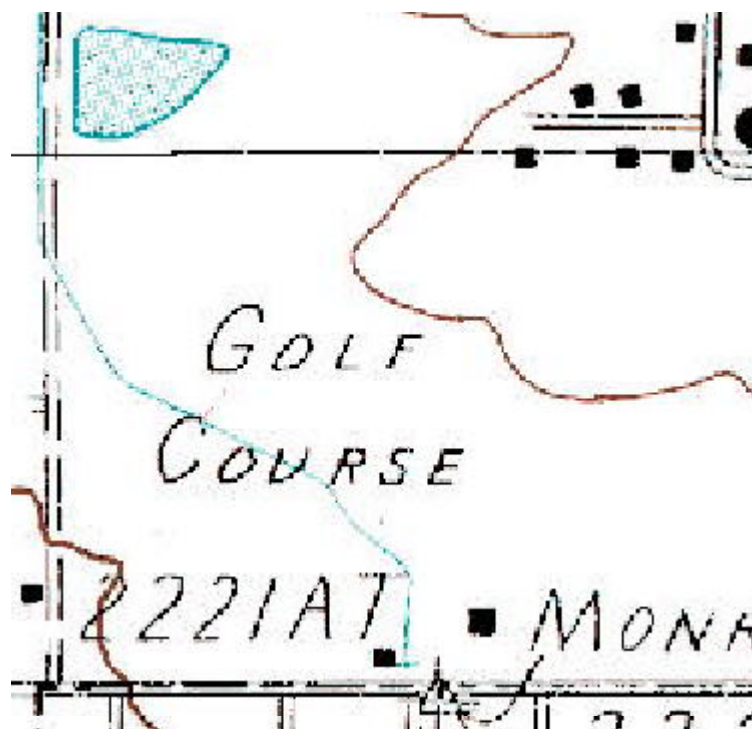


Figure 13. JPEG 30 compressed 7.5' USGS DRG (6.0 Mbytes).



Figure 14. JPEG 10 compressed 7.5' USGS DRG (3.1 Mbytes).